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Digital Library of Mechanisms

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Abstract

The "Digital Library of Mechanisms" has developed within the European project ThinkMOTION (http://www.thinkmotion.eu/), which spanned over three years (2010 – 2013). The digital library contains digitized materials in Mechanisms Science: courses, guides, articles, theses, images and videos of experimental stands of mechanisms. The Digital mechanism library was integrated into the Europeana Portal. The digitization line, achieved in the Department of Mechatronics of the Mechanical Engineering Faculty of the University Politehnica of Timişoara, had an important role as well as its digital repository in Mechanism Science.

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Keywords: digital library, mechanism, digital repository, mechanism science

1. Introduction

The digital library can be regarded as a system, which manages a collection of digital information resources. Its goal is to preserve information over long term and to make it available to users by means of specific mechanisms that facilitate retrieval, browsing and access. The term digital library appeared in the early 90's. More exactly, in 1993 the term is recorded in the title of a report to the National Science Foundation: "Source Book on Digital Libraries." The digital library is nothing more than a traditional library updated to fit the digital era. It is common knowledge that the traditional library is defined as:

- a collection of books, periodicals, standards, patents, and so on;
- an institution that collects books, periodicals, etc. and makes them available to readers in an organized manner;
- a collection of documents kept for referencing or borrowing;

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- a repository of documents for reading or study;
- a building, which houses a collection of documents.

The digital library can be likened to a collection of digital resources where the processing of digital resources is similar to those in a traditional library, i.e. acquisition, cataloging, indexing, storage, retrieval, the aim being to facilitate users the access to resources collection. Table 1 presents a comparison between the characteristics of the traditional and digital libraries.

Table 1. Characteristics of the traditional and digital libraries.

Traditional library		Digital library	
Resources of information	physical	Resources of information	virtual
Storing type	printed	Storing type	electronic
Acquisition	traditional	Acquisition	on-line
Cataloging	traditional	Cataloging	not available
Indexing	traditional	Indexing	automated
Storage	traditional repositories	Storage	digital repositories
Accessing	by hand/automated	Accessing	on-line
Preservation	traditional	Preservation	electronic

Information resources possessed by both a traditional library and a digital library are the following: books, manuals, treaties, compendiums, dictionaries, encyclopedias, journals, articles, PhD theses, lectures, practice books, laboratory guides, design guides, standards, patents, photographs, maps, etc [Lovasz E.A., 2011].

All these information resources, after purchasing, are going to be processed (cataloged, indexed and preserved). Then they are going to be stored in traditional or digital repositories (for digital library) so that they are prepared for access of interested users. The difference between the two types of libraries is the support of information resources and the way to access the desired information. In a traditional library, the access to the desired information is free. In addition, the user becomes the owner of the informational resource. In a digital library, the situation is more complex. The user may become the owner of a copy of the information resource and the information may cost.

Digital content production is still in the pioneering stage at national level. The institutional digital repository is the result of digitizing traditional documents with the aim to conserve and preserve the documents. Digital conversion involves dismantling of documents in order to transform information into a digital repository by means of a digitization line. The actions assumed by digitization may lead to physical degradation of documents. In order to preserve the integrity of documents, it is necessary to capture images of the text and turn the pages one by one, manually or automatically. Digitization is a global problem that currently attracts more and more researchers, specialists in computers, information science and communication.

Services and benefits of a digital institutional repository are:

- permission to publish scientific information from authors;
- fast access to scientific information for users;
- promoting of newest scientific information;
- visibility of scientific information inside the community;
- increasing number of members of the institutional digital repository;
- increasing scientific production;
- free of charge scientific information inside the academic community.

Members of the academic community benefit of multiple statute of author, user and researcher.

The institutional digital repository fulfills the following functions:

- collecting information resources;
- securing of information resources;
- opening of unlimited access to information resources;
- visibility of information resources.

Stagnation of an institutional digital repository can be caused by:

- lack of awareness from the academic society;
- lack of efficient IT infrastructure;
- lack of funds.

Scientific information in the digital institutional repository can be archived by the publisher or self-archived by the author.

Research objectives play an important role in promoting digital repository, as follows:

- awareness of specialists;
- the quality and the coverage of scientific areas of content provided by the members of the academic community;
- attitude of students on the development of the information society and the information requirements;
- identifying the link between scientific research, publishing in open access, national and international recognition;
- how teachers promote their scientific production.

In conclusion, we can say that institutional digital repository is a digital library, a product of information technology, with the role of management and dissemination of digital materials created by its members, resulting in national and international visibility of scientific production.

The database *Bibliographical description* is a database of the digital library including bibliographical description of publication items in the field of mechanisms science.

The metadata fields in the database are assigned to the following elements (fig.1):

- IDDB - unique identification number for the individual publication;
- author - contains the name and surname of the author or authors;
- title – indicates the title of the publication;
- info-title - contains information about the subtitle of the publication;
- language - indicates the language in which the publication was written;
- place - shows the place of the publisher;
- publisher - name the publisher;
- year - sets the year of publication;
- indexing form - provides information on the indexing form, such as: lecture notes, textbook, laboratory guide, patent, dissertation, report etc.;
- cover sheet – asks for the link to upload the scanned cover of the publication;
- document – provides the link to the online digital publication.

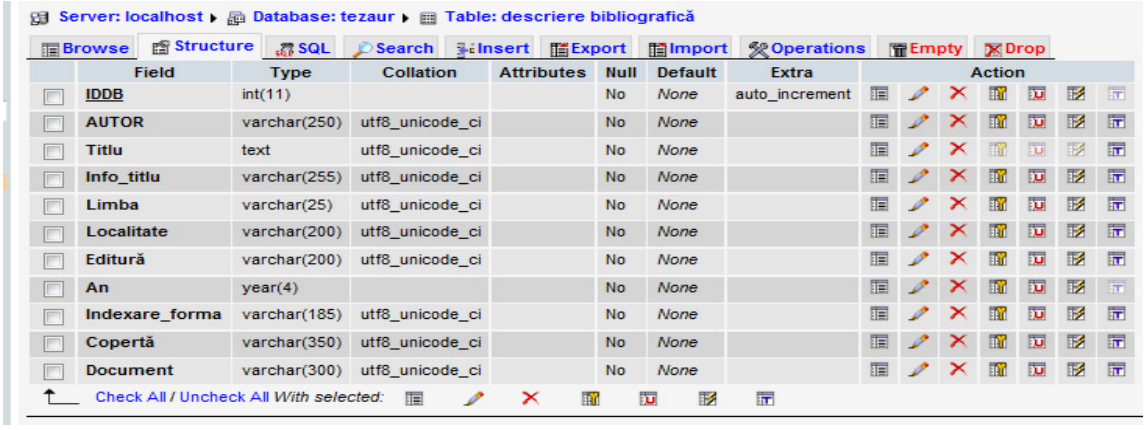

Fig. 1. Structure of the database *Bibliographical description*.

The database *Bibliographic description* has a flexible, logic structure. Other fields can be added without interfering with the existing database content. Note that bibliographic description is nothing but the representation of bibliographic items: author, title, city, publisher, year, according to current standards [Lovasz E.A., 2011].

Having established a database structure, the next step is to enter the items.

After the fields were created the database was filled in with bibliographic description information, taking into account the cataloging and indexation current rules. A print-screen of the result is shown in figure 2.

DDB	AUTOR	Titlu	Info_titlu	Limba	Localitate	Editură	An	Indexare_forma	Copertă	Document
1	Perju, Dan	Contribuţii la sinteza mecanismelor plane pentru c...		rum	Bucureşti	Institutul Politehnic "Gheorghe Gheorghiu-Dej	1971	Teză de doctorat	Coperta_1.jpg	Carte_1_Perju_teza_doctora
2	Lovasz, Erwin-Christian	Sinteza mecanismelor generatoare de funcţii cu apl...		rum	Timişoara	Universitatea "Politehnica" din Timişoara	1998	Teză de doctorat	Coperta_2.jpg	Carte_2_Lovasz_teza_doct
3	Mesaroş-Anghel, Voicu	Contribuţii la sinteza mecanismelor articulate apl...		rum	Timişoara	Universitatea Tehnică din Timişoara	1991	Teză de doctorat	Coperta_3.jpg	Carte_3_Mesaros_teza_doc
4	Văcărescu, Ioan	Sinteza structurală şi dimensională optimală a mec...		rum	Timişoara	Institutul Politehnic "Traian Vuia" din Timişoara	1989	Teză de doctorat	Coperta_4.jpg	Carte_4_Vacarescu_teza_d
5	Kovacs, Francisc	Contribuţii la elaborarea unei metode unitare de s...		rum	Timişoara	Institutul Politehnic "Traian Vuia" din Timişoara	1969	Teză de doctorat	Coperta_5.jpg	Carte_5_Kovacs_teza_doct
6	Dolga, Valer	Sinteza dimensională a mecanismelor cu cuple cinem...		rum	Timişoara	Universitatea Tehnică din Timişoara	1992	Teză de doctorat	Coperta_6.jpg	Carte_6_Dolga_teza_doctor
7	Zăbavă, Eugen-Sever	Contribuţii la analiza şi sinteza mecanismelor cu ...		rum	Timişoara	Universitatea "Politehnica" din Timişoara	2009	Teză de doctorat	Coperta_7.jpg	Carte_7_Zabava_teza_doct
8	Lovasz, Erwin-Christian	Mecanisme de tip centroidal	Manual	rum	Timişoara	Editura Politehnica	2009	Manual	Coperta_8.jpg	Carte_8_Mecanisme_de_tip
9	Lovasz, Erwin-Christian	Getriebelehre II	Kurvengetriebe	ger	Timişoara	Editura Politehnica	2008	Curs	Coperta_9.jpg	Carte_9_Getriebelehrell_Kur

/ Uncheck All With selected:

Fig. 2 Filled in database.

2. Information resources and technologies to digitize them

Generally, the library contains documents whose content refers to information in all fields of science and technology. A specialized library is a specific library on a certain domain. For example, there is a technical library for the field of technique. A super specialized library within the technical library is the library of mechanisms. Figure 3 schematically renders information resources in the field of Science Mechanisms.

The digital library can be regarded as a system, which manages a collection of digital information resources in order to preserve them over long term and to make them available to users by means of specific mechanisms that facilitate retrieval, browsing and access [http://www.europeana.eu/portal/], [http://www.dmg-lib.org/dmglib/main/portal.jsp], [Brix, 2007].

Fig. 3 Information resources in the field of mechanisms.

Digital library mission is to provide users with a large number of informational resources and efficient access to them. The digital library must have three lines of orientation:

- online accessibility;
- digitization of traditional collections;
- preservation and storage.

Digital resources can be classified according to the following criteria:

- type of document: e-books; e-journals; e-photos; e-archives.
- category: thematic digital collections.
- copyright: open access collections; free open access collections; restricted access collections.
- organization: federated collections (grouping several sub collections) ; independent collections.
- location: distributed collections; centralized collections.

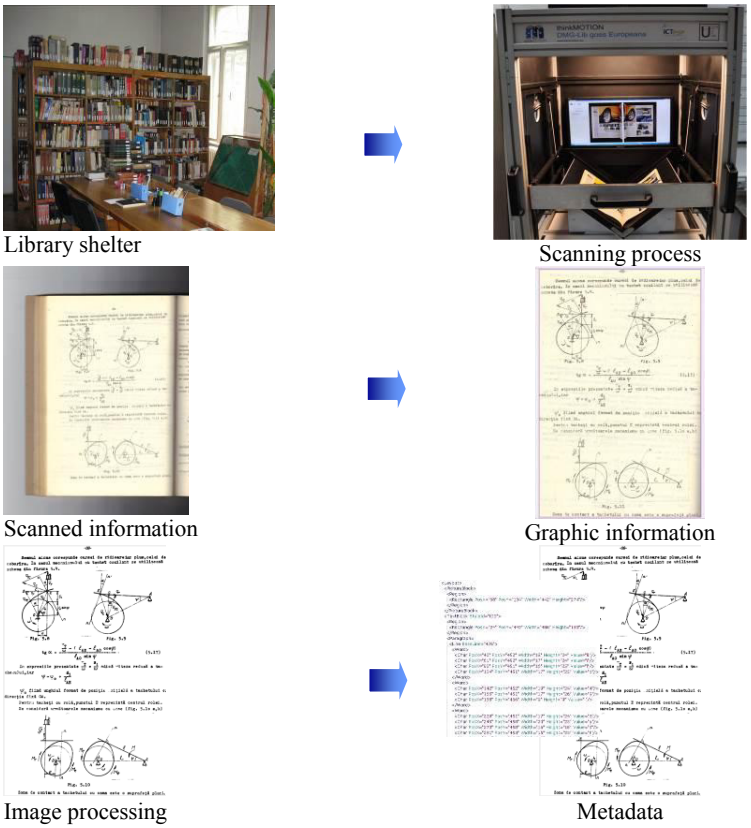

Fig. 4 Digitization of an information resource. Example: specialty book.

Digitization process involves the following steps (Fig. 4) [Kerle, 2011], [Dőring, 2012], [Ciupe, 2012]:

- identifying of information resources;
- scanning of the information;
- digital processing of scanned information;
- obtaining of graphic information;
- image processing;
- obtaining metadata.

Block diagram of a digital library is shown in figure 5 [Dőring, 2012]. It contains the following information flow from the raw information source to the user: sources of information; digitized information; processed information; metadata; unprocessed information database; online database; information management; portal; user.

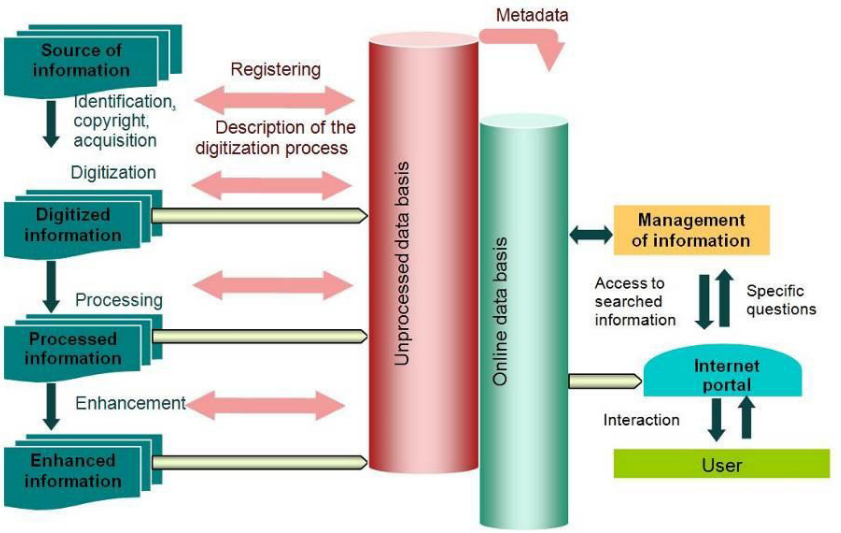

Fig. 5 Block scheme of a digital library [Dőring, 2012].

Once the database has been achieved with the titles of publications of UPT professors in the field of Mechanisms Science, the digitization process could start. First, a self-developed digitization line provided raw scanned images. These images were further processed by means of the programs Scan Tailor and ABBYY Fine Reader, which produced documents in searchable PDF format.

Prior to digitize a certain publication, one must consider the law nr.8/1996 [Law 8/1996] on copyright and related rights underlying the digitization of publications. Subject to copyright covers original works in the arts, literature, science (literary or scientific works, conferences, sermons, pleadings and so on). A work may have one or more authors, the author may be individual or collective (community).

Content of copyright consists of moral rights, public disclosure, recognition of authorship, right to the title of the work, right to integrity of the work, right to retract work, right to unlimited inheritance.

Duration of copyright spans different periods, as follows [[Law 8/1996]:

a. copyright work is active since the creation date, duration: 70 years PMA (post mortem authors);

b. special cases:

- work published after termination of copyright: 25 years;
- work published under a pseudonymous: 70 years after the disclosure;
- work jointly published: 70 years after the last surviving author's death;
- collective work: 70 years since the work became public;
- software: 70 years after the author's death.

3. 4. Conclusions

European education will rely more and more on individual study, so that digital libraries will be online providers of documentation selected on syllabi criterion. The “Digital Mechanisms Library” is a digital repository in mechanisms science. The bibliographical descriptions were integrated into the DMG-Lib [http://www.dmg-lib.org/dmglib/main/portal.jsp], which is part of Europeana Portal [http://www.europeana.eu/portal/]. The “Digital Library of Mechanism” addresses to all types of users: students, researchers, professors, PhD, etc. in the science of mechanism. The Digital Mechanisms Library in the field of Mechanisms and Machine Science shows a representative example of digitization and storage of technical information resources.

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http://www.dmg-lib.org/dmglib/main/portal.jsp

http://www.europeana.eu/portal/

http://www.thinkmotion.eu/

Kerle, H., Mauersberger, K., Ceccarelli, M. (2011). Some Historical Remarks on Past Model Collections of Machines and Mechanisms in Europe, 13th World Congress in Mechanism and Machine Science, Guanajuato, México.

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